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MAY, 1938

Biography

PROFESSOR B. GALLI-VALERIO

IN March, 1938, the Faculty of Medicine of the University of Milan, held a special meeting to mark 40 years of the Professoriate of one of its first pupils, Monsieur B. Galli-Valerio, Director of the Institute of Hygiene. Born in 1867 and holding the Italian Veterinary Diploma, he came to Lausanne in 1891, to take up complementary studies in tumour medicine and was granted the degree of Doctor of Medicine of the University of Lausanne in 1892.

In 1898 he succeeded Nicolas at the Institute of Hygiene and Parasitology. He reorganised the work and equipment of the Institute and, in 1904, he entered into a quite new Institute. He published many papers on parasitology.

Galli-Valerio has always considered that bacteriology was only a chapter of parasitology and this is why he devoted the winter session to general parasitology and to animal parasites (arthropods, worms, protozoa, chlamydozoa and filtrable viruses), whilst the summer session was reserved for vegetable parasites (blastomycetes, hyphomycetes and bacteriacæ). The two courses dealt not only with parasites but with the maladies they occasioned in our country and in tropical countries and also on their treatment and prophylaxis. These lectures embraced, therefore, all the comparative pathology of the parasitic maladies of men and animals. As for the hygiene course, it was not only given to doctors, but included also an industrial hygiene course.

Galli-Valerio is an honorary member of the Society of Swiss Veterinarians and of the Society of Vanilois Veterinarians and has reserved for the Swiss archives those of his works which have a veterinary character.

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Editorial

THE FIGHT AGAINST BOVINE TUBERCULOSIS IN DENMARK

WITH the awakened interest which the establishment of the new Veterinary State Service has produced in the fight against Tuberculosis in cattle, the article which appears in another column on " The Combating of Tuberculosis among cattle in Denmark " will be read with much interest; as it demonstrates the great difficulties which have to be overcome even in a country in which it is much less difficult to isolate districts than in our own. A large portion of the country of Denmark consists of islands which can only be reached by boat and the entrance to which in regard to cattle can be readily controlled. Denmark is, as is well known, pre-eminently a dairying country, containing no less than about 1,700 individual dairies (a great majority of which are co-operative); and there is a total cattle stock of about 200,000, so that every dairy on an average is supplied with milk from some 118 producers. This enables the stocks of the country to be divided into convenient sizes and " a local board of directors can easily keep in touch with the work carried out in each individual dairy."

Our colleague, Doctor Woldike Nelson, gives us a *resumé* in his article, of a plan initiated in 1922 which is similar to the one which is now being formulated by our own Veterinary State Service, by which the whole of the cattle on this Island (some 3,800 in all) were tuberculin-tested, the cost being paid partly by the State The reactors were either sent to the slaughterhouse at once or carefully isolated; and in 1932 several of the dairies (of which there were 20 in all) were entirely free; whilst the herds of the other dairies showed a freedom from tuberculosis varying between 95—100 per cent.

It was at this stage that the legislator stepped in and compelled the last of the tuberculous animals to be forcibly removed from each dairy in the district. The paragraph dealing with this in the Tuberculosis Act of Denmark, 1932, is as follows:

" When 90 per cent. of all cattle stocks within one or several dairy districts are free from tuberculosis, the Minister of Agriculture is entitled, on application from these stock-owners, to demand that the remaining stocks be tuberculin-tested at the expense of the State and that the reacting animals be killed in a public slaughterhouse within the time limit set by the dairy concerned. The loss involved in this transaction, i.e., the difference between the selling price and the earning value of the animal, is refunded by the Treasury (one half) and by the dairy district concerned (one half). The valuation is carried out by three men, two of whom are appointed by the dairy district concerned, one being selected by the owner of the animal." When, in 1936, the number of tuberculosis-free stocks

in the " Stokkemarke " dairy district was 234 and in the " Ostofte " dairy district 186 (that is, over 90 per cent. of all the stocks in these districts) it was recommended to the Minister of Agriculture that the remaining 204 reactors (distributed over 30 stocks) be destroyed according to the Act quoted above.

The reactors were then valued to represent a total value of 71,775 Kroner* and when slaughtered, they brought 36,680 Kroner. This gave a difference of value amounting to 35,095 Kroner, of which amount the dairy and the State each had to pay half.

After these animals had been killed, a tuberculin test was performed in the Spring, 1937, on all the stocks in these two dairy districts. In 10 stocks 17 reactors were found. These animals were slaughtered, and a further tuberculin test, performed a few months later, revealed no more reactors in these herds, all of which may now be looked upon as being free from tuberculosis.

For a list of the measures which have proved satisfactory in Denmark, our readers are referred to Doctor Nielsen's article, which also refers to the scheme, so successfully carried out for several years, of instituting a central farm for the breeding and raising of tuberculin-free heifers; the idea being that should stock holders have difficulty in isolating their calves and heifers safely, they may send them to the central farm where they are kept in proper condition for a stipulated time.

Every Spring some 1,800 heifers have been received from all parts of the country. They are under the strict supervision of the Veterinary Officials, being examined for infectious abortion as well as tuberculosis; and if desired they are not returned to their owners until pregnant.

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*£1=22,40 Kroner. 1 Krone=100 Ore.

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General Articles

ACETONE IN THE MUSCLES OF ANIMALS SLAUGHTERED FOR HUMAN FOOD

By T. D. YOUNG, O.B.E., M.R.C.V.S., D.V.S.M.

MEAT inspectors are familiar with a peculiar odour which often exists in the flesh of fevered animals. Various theories have been evolved as to the origin of this odour. We are, therefore, indebted to Blanchard and Houdiniere*, who have lately carried out some interesting investigations as to the presence of acetone in the flesh of food animals. Their conclusions are as follows:

> " In our experience we have found acetone in normal muscles even when the tests have been made with muscles within one hour after slaughter. Some flesh has a distinct odour of acetone and in some cases, principally those where the cows have been in a condition of gestation, we have found the quantities more or less abundant up to 11.5 milligrams per cent.
>
> Acetone persists a long time in raw muscles and does not disappear even when grilled; in some cases the odour was so repugnant that the meat was unwholesome.
>
> Practically, there is reason to suggest that the systematic examination for the presence of acetone in the muscles of animals when in an advanced state of gestation, more especially if the liver shows evidence of degeneration, and in cases of fever. The method of Bougault-Gros is recommended as the most satisfactory test."

Acetone is a substance found in urine, associated with certain diseases and indigestion.

It has been known for some time that acetonæmia is found in the blood of females about the time of parturition and it is thought that the condition is associated with incomplete combustion of fats, and a defect in the functioning of the kidneys.

* *Receuil de Medecine Veterinaire*, December, 1937.

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LEPTOSPIROSIS IN GLASGOW TRIPE WORKERS*

by **R. D. STUART**

With report of a possible case of *Leptospira canicola* infection.

THE association of rats, damp working conditions and human infection with *Leptospira ictero-hæmorrhagiæ* has again been demonstrated. Following on the recognition of a case of Weil's disease in a female tripe worker, it was found that 4 out of 25 other workers had been infected. Although this industry was conducted on hygienic lines the buildings were not rat-proof and the floors and benches were undoubtedly contaminated with rats' urine during the night. The high incidence of Leptospiral infection in the local rats, 11 out of 14, the wet conditions and the frequent occurrence of minor scratches among the workers all contributed to the infections.

One woman showed serological evidence of infection with *Leptospira canicola* but no pertinent clinical history could be obtained. This Leptospira is serologically distinct from *L.ictero-hæmorrhagiæ* and has been found only in dogs. Proved human infections have been recorded in Holland, and it seems likely that unrecognised cases are occurring also in this country.

THE COMBATING OF TUBERCULOSIS AMONG CATTLE IN DENMARK

By F. WOLDIKE NIELSEN,

Veterinary Inspector, Copenhagen

PERPHAPS some readers know that in Denmark as well as in several other countries in recent years energetic efforts have been made to eradicate tuberculosis from the cattle of the country.

It began nearly half a century ago when Professor Bang suggested the isolation method by which a herd may be freed from tuberculosis within a few years. It was not until the last decade, however, that this work has been gaining headway, and the public in general have realised the advantages of carrying out this work on as broad a base as possible: during these years the combating of tuberculosis in cattle has become a combined task, the accomplishment of which is now being

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* *The Lancet.*

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planned and carried out by greater and smaller Co-operative Associations. In Denmark there are about 1,700 dairies, a great majority of which are Co-operative, and as the total number of cattle stocks is about 200,000, this means that every dairy on an average is supplied with milk from 118 producers. Thus all the stocks of the country are already divided into districts which are fairly well defined and of such a suitable size that the local board of directors can easily keep in touch with the work carried out in each individual dairy. During recent years the combating of tuberculosis in cattle has been organised, with distribution of the work in the districts of the individual dairies.

On Bornholm—an island in the Baltic, reached by boat from Copenhagen in about 8 hours—the dairies (20 altogether) decided in 1922 and the following years to carry through eradication methods against tuberculosis in cattle, each dairy taking care of its own district. All the 3,800 cattle on this island were tuberculin tested (the cost of which was paid in part by the State); the reacting animals were sent to the slaughterhouse at once—or isolated according to particular directions. The work was carried on in this way until 1932, when several of the dairies had not even one tuberculous animal in their respective districts, while the herds of the other dairies showed a freedom from tuberculosis amounting to 95—100 per cent. As it was found impracticable to get any further through voluntary efforts from the individual stock-owners, the legislature was induced to pass a Bill (see below) according to which the last tuberculous animals could be forcibly removed from each dairy district.

In the following years the combating of tuberculosis in cattle was carried through on many of the Danish islands—mostly small islands (e.g., Læsö and Samsö in Kattegat, Ærö and Taasinge south of Fünen, Fanö at the harbour entrance of Esbjerg)—and the successful work carried through on those islands encouraged many other parts of the country to take up the work with energy and perseverance.

In order to give readers an idea of how the work progresses in one of those districts which have ardently set out to combat tuberculosis in cattle, it will be appropriate here to mention more detailed the conditions in Maribo county. Maribo county consists of two islands, Lolland and Falster, situated close to each other, south of Zealand. These two islands comprise an area of 1,700 sq. km. and practically all the soil of this area is being tilled. The total number of cattle herds is a little over 9,000, comprising altogether about 135,000 cattle. There are 67 dairies, 50 of which are co-operative dairies, while the remaining 17 are private dairies.

In the late twenties many of the Lolland-Falster dairy districts carried through tuberculin tests in every herd in the district. In 1929-30-31, a rather extensive epidemic of foot and mouth disease broke out and stopped the tuberculosis work in general; and this work was not taken up again until 1933-34.

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That this work had attracted a great deal of interest is evident from the fact that, at the suggestion of the joint board of directors of the dairies in Maribo county, in the Winter 1933-34 nearly all the Co-operative dairies in the country adopted the following rules:

(1) At the expense of the dairy (*i.e.*, all the members of the Co-operative dairy) every member who wished so could have his herd tuberculin-tested once a year as long as there was found to be any reactors on his farm, and afterwards once every other year.

(2) After a certain period (most often 4, 5 or 6 years) the dairy was to pay less for the milk received from the herds in which there still remained reactors than for the milk from tuberculosis-free herds. This reduction in the price paid for the milk varied somewhat in the various dairy districts; most often it was only a small amount—for example, one tenth of a farthing per liter—but in some districts it was considerably higher.

Those who are not acquainted with conditions in Denmark might perhaps wonder that such relatively slight measures were able to promote the work considerably. But, according to point 1 all the members would have to pay a part of the expenses connected with the tuberculin tests, and this made *all* of them take part in the work, each stock-owner reasoning like this: If through the dairy we have to pay our part of the cost of tuberculin tests on other people's stocks, we may just as well have our own stocks tested and in that way get something for the money we have to pay. It is true that there was only a small reduction in the price paid for the milk if the herds proved not to be free from tuberculosis at the end of the stipulated period, but at a time when it is very hard for the farmer to make his farm pay, even a slight but permanent reduction in his income is apt to be a sufficiently convincing measure to persuade him.

Presumably it will be of some interest to follow through a few years the work carried out by some of these dairies for the eradication of tuberculosis in cattle. I may then pick out two fairly large dairies on Lolland, " Stokkemarke " and " Ostofte," from which the Veterinary Department has received reports on all the tuberculin tests carried out in the period of 1934-37. The districts of the two dairies overlap in part, and the combating of tuberculosis has been carried out at about the same time; so they may here be treated as one. After the two dairies in 1934 had adopted the aforementioned rules for the work of combating tuberculosis in cattle, a tuberculin test was made of all the animals in all the herds furnishing milk to the two dairies. It was found that among the total 447 herds covered by this examination 209 tuberculous animals, *i.e.*, 46.8 per cent. of the herds showed some positive reactors; these herds comprised 5,574 animals submitted to this test, and a positive reaction was obtained in 1,221, *i.e.*, in 21.9 per cent. of all the animals.

The distribution of tuberculous animals in the various herds is illustrated by the following numerical survey, in which the numbers above the line give the

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number of herds, and the number of tuberculous animals recorded below the line.

75	34	20	14	9	8	2	4	2	4	2	1	1	4	4	1	2	6	2	3	2
1	2	3	4	5	6	7	8	9	10	12	13	14	15	16	17	18	19	20	21	22
							1	1	1	2	1	1	1	1						
							24	25	26	29	31	33	37	44						

Then the real fighting work was started, being aimed in the first instance at the eradication of tuberculosis in those herds that showed only a relatively small number of reactors. These animals were removed from the herds—in most cases according to the so-called Destruction Act, put into force in November, 1934 (see below). In several of the other, more infected, herds the work had already been going on for some years, the reactors being kept isolated from the non-reacting animals. Other stock-owners commenced of their own accord to work along the same lines, but in view of the rather brief period (4 years) in which the dairy district was to get rid of tuberculosis in cattle, it is obvious that owing to the abnormally great percentage of removed cows, the herds had to be replenished with a good many purchased cows so as not to reduce too much the amount of milk supplied to the dairy.

Other stock-owners were not able to establish such a separation for a considerable length of time. They isolated their non-reacting breeders, milked the reactors unto dryness and sold them, and for the obtained money they then bought a smaller number of animals than they had owned before.

As a result of this purposeful work, in the following year the number of herds with reacting animals was cut down to 108 while the total number of remaining reactors was figured to be 513; only a few of the stocks which had shown reactors in 1934 presented new reactors in 1935. Likewise there were only very few new-infected herds—and in these the new reactors were practically all animals which had been bought; after the removal of these reactors the following tuberculin tests showed that the stocks concerned were again free from tuberculosis.

In the Spring of 1936 the incidence of tuberculosis was cut down to include only 54 herds with altogether 296 reactors. After a few more of these stocks had been cleansed, the local board of directors realised that if the conclusive work were not to be delayed too long it would be necessary to discontinue the work after the principle of voluntary co-operation and carry through the eradication of tuberculosis in the remaining herds by force.

In mentioning the eradication of tuberculosis in cattle on Bornholm I referred to a paragraph in the Tuberculosis Act of 1932, which was now put in force. It says:

> " When 90 per cent. of all cattle stocks within one or several dairy districts are free from tuberculosis, the Minister of Agriculture is entitled, on application from these stock-owners, to demand that the remaining stocks be tuberculin-tested at the expense of the State and that the reacting animals be killed in a public slaughterhouse within the time limit set by the

dairy concerned. The loss involved in this transaction, *i.e.*, the difference between the selling price and the earning value of the animal, is refunded by the Treasury (one half) and by the dairy district concerned (one half). The valuation is carried out by three men, two of whom are appointed by the dairy district concerned, one being selected by the owner of the animal."

When, in 1936, the number of tuberculosis-free stocks in the " Stokkemarke " dairy district was 234 and in the " Ostofte " dairy district 186 (that is, over 90 per cent. of all the stocks in these districts) it was recommended to the Minister of Agriculture that the remaining 204 reactors (distributed over 30 stocks) be destroyed according to the Act quoted above.

The reactors were then valued to represent a total value of 71,775 Kroner,* and slaughtered, they brought 36,680 Kroner. This gave a difference of value amounting to 35,095 Kroner, of which amount the dairy and the State each had to pay one half.

After these animals had been killed, a new tuberculin test was performed in the Spring, 1937, on all the stocks in these two dairy districts. In 10 stocks 17 reactors were found. These animals were slaughtered, and a new tuberculin test, performed a few months later, revealed no more reactors in these herds, all of which may now be looked upon as being free from tuberculosis.

The same eradication of the stocks for tuberculosis that was carried through in these two dairy districts has been accomplished and is going on in many other dairy districts, not only on Lolland-Falster, but also on Zealand and Fünen. On Fünen there are now 46 dairy districts entirely free from tuberculosis, while in 55 dairy districts between 90 and 99 per cent. of the stocks are free from tuberculosis, so that also these districts are able now to carry through the cleansing process. The dairy districts of Zealand and Fünen have planned this work along somewhat similar lines as those adopted by Lolland-Falster, but with somewhat modified rules concerning the reduction in the price paid for the milk. For example, there are many districts in which the dairy in the combating period (usually 5 years) keeps back a certain amount of the yearly surplus pay accorded to the milk producers: per each 100 kg. of milk received from herds that are not free from tuberculosis the dairy keeps back the first year 5 Ore, the second year 10 Ore, the third year 15 Ore, the fourth year 20 Ore, and the fifth year 30 Ore. The stock-owner who is able before the yearly distribution of surplus pay to present a certificate to the effect that all the animals of his stock have passed a tuberculin test with negative reaction is exempted from the reduction in surplus pay. The amounts of deduction kept back by the dairy are deposited in a bank on a special account. Those members of the dairy who before the end of the stipulated period present a veterinary certificate to the effect that their stocks are free from tuberculosis receive at once the full amount deducted from their surplus pay. If, on the other hand the stock is not free from tuberculosis at the

* £1—22,40 Kroner. 1 Krone—100 Ore.

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end of the period, the full amount deducted from the surplus pay goes to the dairy.

In Jutland too this form of combating of tuberculosis is progressing rapidly. For the sake of illustration it may be mentioned that in one county the number of tuberculosis-free stocks rose from 897 in 1934 to 4,327 in 1937. In some parts of Jutland, however, this work is impeded to some extent by the local form of agriculture: purchase and fattening of steers. But interest in the question is increasing even in these parts of Jutland, and more and more cattlemen take up the work.

In Denmark the combating of tuberculosis in cattle is carried out, on the whole, after the principle of voluntary co-operation, but this work is supported in various ways through the legislation. For the sake of illustration it may be mentioned that slaughtering of cows suffering from tuberculosis of the udder has been compulsory since 1898, and the same rule applies (since 1928) to cows suffering from uterine tuberculosis and to all animals suffering from advanced forms of pulmonary tuberculosis involving a risk of infection. Moreover, since 1898, it has been compulsory for the dairies to pasteurize all milk delivered for feeding of animals.

Since 1893, the State has granted the necessary means for the performance of tuberculin tests on all herds the owners of which will pledge themselves to carry out the combating of tuberculosis in keeping with the given directions (isolation or removal of the reactors). Still, the greatest assistance given by the public in the performance of this work is the above-mentioned Destruction Act which was not adopted until November, 1934. At this point of time a bill was passed that aimed chiefly to reduce the total number of cattle in the country by promoting the sale of cattle and beef, besides to having a stimulating effect on the market price of meat. This measure was utilised in the combating of tuberculosis. The arrangement was made that on slaughtering of all sorts of cattle the slaughterer was to pay a fixed charge, which varies, for calves and full grown cattle, according to weight from 3 to 18 Kroner.

These amounts of money are paid into a fund under the management of the Ministry of Agriculture, and the fund is used for the payment of tuberculous animals sent for slaughter.

If a stock-owner wishes to commence taking part in the combating of tuberculosis and he is willing to carry through the directed separation between reactors and non-reactors (the same obligations as on receipt of a government grant for the performance of tuberculin tests) he can each year have slaughtered up to 10 reactors at a fairly good price—at the present, 90 Ore per kg. of slaughter weight. The payment is derived from the above-mentioned fund, and the stock-owner is guaranteed this price, no matter whether the meat is accepted for human food or it is discarded.

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In the case of stocks containing animals with some form of open tuberculosis, a larger number of animals may be slaughtered at one time, but in such cases it is required that the entire stock, with exception of non-reacting calves, is to be sold for slaughtering within 6 weeks.

The obligations which the stock-owner subscribes to when he makes use of the Destruction Act he is bound to carry out for at least two years. In this period, for instance, he is allowed to supplement his stock only with animals originating and transferred directly from a tuberculosis-free stock (and this term is defined as a stock that has passed the tuberculin test twice at an interval of at least half a year, and the owner of which has pledged himself to keep his stock free from introduction of tuberculous animals). If such a stock-owner fails to meet his obligations he will have to return a certain part of the amount of money he has received.

The cattle taken over by the fund are utilised as well as possible; the most suitable are sold to butcher shops, while the remaining part accepted for human food are turned over to packing-houses and other industrial plants. In this way part of the expenses are recovered. Thus it may be mentioned that for the last year the average expense for the fund per head of cattle taken over in this way amounted to about 70 Kroner.

In conclusion it may be mentioned that some Danish dairies have instituted and conduct a central farm for breeding and raising of tuberculosis-free heifers. This central farm is located in the northern part of Jutland; its grazing fields measure 1,552 hectares (about 3,900 acres). This entire area, which is a State property, was formerly a part of a large bog which has been under cultivation for the last decades.

The idea with this central cattle farm is that such stock-holders who in their combating of tuberculosis have difficulty in isolating their calves and heifers safely, may send their heifers to the central farm where they are kept isolated for a stipulated time.

Every Spring this central farm receives about 1,800 heifers from all parts of the country. During their stay on the central farm these heifers are under the observation of the Veterinary Department as to their state of health and general condition: besides they are submitted now and then to tuberculin tests and examination for infectious abortion. The heifers are returned to their owners in a state of pregnancy.

As far as the practical combating of tuberculosis is concerned this central farm plays only a minor rôle, as it is indeed a very limited number of stock-owners who are able to make use of this central farm from year to year. A greater importance is to be attached to the indirect significance of the central farm in this respect: that the value of isolation measures as part of the combating of tuberculosis in cattle is thus established more emphatically in the mind of the public.

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OBSERVATIONS ON CONTAGIOUS GRANULAR VAGINITIS IN SOUTHERN RHODESIA

By WILLIAM ORR, M.R.C.V.S.

Perak, Federated Malay States.

Synonyms: Contagious granular vaginitis, nodular venereal disease, infectious vaginitis, specific vaginitis, vaginitis verrucosa, infectious vaginal catarrh, metritis et vaginitis infectiosus, colpitis granulosa infectiosa bovum, Besmettilike vaginitis van beeste (Afrikaans), Ansteckende Scheidenkatarrh (German), vaginite granuleuse infectieuse ou contagieuse (French).

In the literature dealing with the causation of sterility the condition known as contagious granular vaginitis has figured largely since it was first described in 1886 by the Swiss veterinarian Isepponi. Clinicians, groping earnestly for a *causa causans* of the increasing incidence of sterility and abortion, seized upon this demonstrable lesion of the reproductive tract and ascribed to it profound significance. Belief in the ætiological rôle of contagious granular vaginitis was strengthened by the observation of its very high incidence in herds with an unsatisfactory breeding history. At the same time the possibility of the general distribution of the disease in normally breeding herds was not critically investigated. Contagious granular vaginitis was found concomitant with sterility and exalted to a position of marked significance as a causative factor. Later (in 1897) the elucidation of the ætiology of contagious abortion by Bang showed that a high percentage of cases of sterility were directly referable to the sequelæ of abortion and contagious granular vaginitis took a very secondary place in association with sterility (Albrechtsen, 1920; Richter, 1926). Recent research into reproductive physiology, particularly endocrine control and the significance of nutrition on fecundity, has drawn attention to the fine balance and complexity of generative phenomena. It has become clearly apparent that a number of factors direct and indirect, functional, pathogenic and nutritional may inhibit generation by operating upon the numerous vulnerable loci of the generative system. The development of seminal histo-pathology (notably the work of Williams and Savage, 1925), demonstrated the frequency of low potential fecundity and of total sterility which is referable to the male. The application of this information to the problem of sterility has tended to place the determination of causation upon a more rational biological basis.

In spite of the opening up of these new fields " the teachings inculcated among cattle owners by the infectious vaginitis school have, however, died hard." Though the exaggerated malignancy formerly ascribed to vaginitis by Zschokke (1898 and 1900), Hess (1921), Knell (1926), Nielsen (1926), and others is now generally discredited the opinion is very commonly held that the condition causes delayed conception and transient sterility. Vaginitis has been associated

with contagious abortion and the suggestion advanced that the former is merely a symptom of the latter disease. Tutt (1933) gives this as his considered opinion based upon his observation of the concomitance of the two diseases and the fact that the ætiology of vaginitis is still obscure. The two diseases are almost ubiquitous in many areas and it is not surprising that concurrent infections occur but it is not justifiable to suggest a common ætiology without critical investigation of herds in which the possibility of Br. abortus infection has been excluded by serological tests.

Attention was first drawn to the prevalence of the disease in Southern Africa (Natal), in 1912, since when its significance in the causation of sterility has been variously estimated (Quinlan, 1929). In emulation of the Continental school of Hess and others, the condition was regarded as responsible for a high percentage of cases of sterility. Latterly professional opinion in the Union of South Africa, as elsewhere, has tended to relegate the disease to a place of secondary importance (Quinlan, 1929).

Popular opinion in Natal and other places in the Union still ascribes to vaginitis a causative rôle in the occurrence of sterility. Though the disease occurred in all types of bovines it was believed to be commonest in dairy herds. Quinlan, Mettam and Bisschop (1929), state that the disease is very widespread throughout the Union, in some districts almost every dairy herd being infected. The higher incidence in pure bred cattle is believed to occur not as a consequence of their greater racial susceptibilities but as a result of the different conditions of husbandry to which they are subject. As in Europe contagious abortion was found to be largely responsible for the occurrence of sterility where a thorough investigation was undertaken and contagious granular vaginitis was found to occur in herds free from the former disease.

In a table compiled from a questionnaire circulated among South African and Southern Rhodesia farmers Quinlan gives the proportion of infected herds in Rhodesia as 16 per cent. He rightly conjectures that this figure is an underestimation. In Southern Rhodesia the disease appears to have received no official recognition before 1931 when it is mentioned as being more prevalent than had been generally supposed and that it was " doubtless responsible for a great proportion of the cases of sterility." Some years prior to this (1923) the official opinion expressed was that the high incidence of sterility in the Colony was largely due to contagious abortion but that the latter could not be assumed to be the only common factor inhibiting normal breeding. The recommendation given was that an endeavour should be made to locate any other causal lesions which might be present in the genital organs with consequent sterility*.

Observations on the occurrence of the disease in Rhodesia were confined

* The conclusion was arrived at . . . " That there exist genital affections other than contagious abortion in Southern Rhodesia, which are capable of causing serious economic loss to the stock owner and that research is necessary to determine the nature of these genital affections and their treatment." Colony of Southern Rhodesia, Report of Chief Veterinary Surgeon, 1923.

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to dairy cattle (1). Lawrence (1933), in a preliminary note on contagious granular vaginitis pointed out the prevalence of the disease in local dairy herds with satisfactory known breeding records, thus indicating that the gravity of the condition and its sequelæ had been exaggerated.

Various explanations have been advanced as to the mode of operation of vaginitis as an inhibition to reproduction; some of these it might be relevant to discuss below under two main headings:

A. The spermatoxic nature of the vaginal exudate in active cases of contagious vaginitis (as expounded by Wester (1921), Knell (1926) and others):

Schlichte's experiments (1926) on the viability of spermatozoa in normal vaginal secretion and in the vaginal exudate of vaginitis showed that the exudate exerted an adverse effect on the sperms destroying them after half an hour. According to the observations recorded below on Rhodesian cattle the lesions of contagious granular vaginitis are typically confined to the posterior part of the vaginia and the exudate, even in the more marked cases, is not very profuse, showing a tendency to become inspissated and adherent to the muco-cutaneous junction of the labia (2). Unless the vaginal exudate is very copious in the anterior part of the vagina it is improbable that the dilution of the spermatic fluid by the spermatoxic exudate is sufficient to destroy more than a small percentage of spermatozoa. During œstrum the normal cervical and vaginal secretions of mucus are copious and of a fluid consistency which serves as an additional diluent to any spermatoxic substances present in the vagina. Furthermore, the passage of spermatozoa from vagina to uterus is very rapid. In experimental cases where animals have been destroyed several minutes after coitus numerous spermatozoa have been recovered from the uterine cavity. The interval during which the spermatic fluid is subject to the harmful effects of vaginal exudate is brief (if indeed it occurs at all), and in the case of certain sperms, momentary. Inflammation of the cervix, uterus or Fallopian tubes is much more likely to give rise to a highly spermatoxic exudate*. The anatomical sequence and function of these organs is liable to interfere with reproduction should cervicitis, metritis or salpingitis supervene. It should also be borne in mind that spermatozoa can only remain viable in normal vaginal secretion for a very limited period. It may be that in the case of a very weakly fertile bull serving a cow suffering from vaginitis, even the slight disability of a much-diluted exudate may affect the weakly viable sperms. Such males of low potential fecundity should not be used for breeding.

1 " This disease (vaginitis) has been observed in many dairy herds and the percentage affected may be very high. In some herds the affection does not appear to cause much trouble, but in others the results are serious, as the animals have become sterile with consequent loss of calves and milk. Treatment has not yet been too satisfactory but further investigations are in progress." Ibid, 1933.
(References to vaginitis occur in these Reports for the years 1931, 1932, 1933 and 1934.)

2 These observations are borne out by my records of post-mortem material from some 200 cows collected in Edinburgh, Scotland, 1931—1932.

* Falaschini (1934) found the vaginal discharge of normal cows to be neutral while those suffering from metritis, cervicitis and vaginitis exhibited a pH variable between 6.2 and 6.9.

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B. Interference with coitus; hypersensitivity of the vagina and clitoris causing abnormal nervous reflexes:

During the acute phase of the disease it has been asserted that cows will not permit service though they are in œstrum, or that when coitus occurs it is associated with excessive straining and extrusion of the spermatic fluid (Pomayer, 1930). It is extremely doubtful if even severe straining following coitus would effect complete extrusion of the seminal fluid before a considerable number of sperms had penetrated the os uteri. Neither refusal of coitus nor excessive post-coital straining have been observed in infected cows during this investigation. It is possible that during the acute phase of inflammation the clitoris and its fossa become hypersensitive to external stimuli and that such a condition may exert certain abnormal nervous reactions on other genital organs and their normal mechanical function (Frei 1931). Little is as yet known concerning the nervous control of the genital organs or of the reflex mechanisms of orgasm. The statement that spasmodic closure of the os uteri occurs as a reflex result of vaginal irritation is therefore pure surmise.

The typical course of the disease is not characterised by a prolonged acute phase and it is reasonable to assume that any inhibitions imposed by the transient acute phase would be similarly transient raising no permanent or insuperable barrier to fertility.

The present investigation was undertaken with a view to extending the preliminary observations and further confirming the opinions regarding contagious granular vaginitis published in 1933 (Lawrence). Certain other observations relevant to the condition emerged during the investigation and have been included hereunder. The matter discussed may be summarised as follows:

(1) The aetiological association of contagious granular vaginitis with contagious abortion (Br. abortus).

(2) The incidence of contagious granular vaginitis in Southern Rhodesia in animals under different conditions of husbandry falling into three main groups, viz., dairy, ranch and native.

(3) The significance of contagious granular vaginitis as a causative factor of sterility.

(4) Miscellaneous observations on vaginitis, viz., course; age incidence; transmission; clinical and histological morphology of lesions; the confusion in symptomatology arising from regional physiological and pathological phenomena; the status of typical nodules as specifically diagnostic lesions; the advisability of treatment.

1. The Aetiological Association of Contagious Granular Vaginitis with Contagious Abortion (Br. Abortus).

To disprove the supposed ætiological association of contagious abortion and contagious granular vaginitis, periodic clinical examinations for vaginitis and agglutination tests for contagious abortion were carried out over a period of two years. The Laboratory experimental herd (Herd A), composed of about forty

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females (cows, heifers and heifer calves) was utilised for this purpose. Repeated serological tests were carried out at intervals during the period under discussion to ensure that during this period the herd remained free from infection.* Cows were also tested when possible shortly after calving when the reactivity of infected animals is habitually high. During the period of observation every sexually mature female bovine and many heifer calves showed the typical lesions of contagious granular vaginitis in varying intensity, while agglutination tests gave uniformly negative results throughout. Quinlan et Al (1929) in South Africa similarly found a high incidence of contagious vaginitis in several herds free from contagious abortion. Further findings on examination and testing of a dairy herd (Herd B) of thirty-nine head including nine calves gave similar results. In this herd at the time of examination thirty-two animals showed visible lesions, one was a doubtful case and six (including five calves) were negative. The agglutination test gave a negative result in every case. Herd C consisted of several mobs of ranch cattle observed under typical ranching conditions. Representative lots were chosen at random from a mob of grade cows with calves, a herd of pedigree cows and calves and a herd of heifers. Of eighty-five mature animals seventy-six showed lesions of vaginitis, and among seventeen calves fifteen were infected. There were no reactors to the agglutination test.

From the above results it will appear that contagious granular vaginitis can exist in a herd which is entirely free from contagious abortion and that there is no common pathogen which can be regarded as the causative factor of the former disease. As has been stated already, the erroneous opinion that contagious vaginitis is an expression of contagious abortion (Br. abortus) arose out of the fact that the two diseases, as a result of their high incidence were naturally often concomitant. The opinion however was founded on incomplete observation. When vaginitis has been sought for it has been found in herds free from the other disease.

2. The Incidence of Comtagious Granular Vaginitis in Southern Rhodesia.

The high incidence of this condition in many herds of dairy cattle has been recorded from time to time by veterinarians who suspected vaginitis to be a cause of sterility. Otherwise the condition has been looked for infrequently and a high incidence in ranch cattle and indigenous native stock was not expected. At the commencement of this investigation it was anticipated that the disease would certainly be very prevalent among well bred dairy cattle maintained under highly artificial conditions. Housing, concentration, close contact and continual handling, it was believed, would tend to faciliate transmission of vaginitis. Under ranching conditions among cattle of a beef type on open range or in large paddocks the disease was not expected to occur with any great frequency. Similarly among hardy native stock the incidence was believed to be low. The present investigation effectually disposed of these preconceived ideas. Herds C. and D. of ranch cattle on examination revealed an incidence of ninety-one positives in one hundred

* Tests were carried out in dilutions of 1:25, 1:50 and 1:100.

cases examined (90.6 per cent.) respectively. Typical native Mashona cattle and two cases examined (89.2 per cent.), and twenty-nine positives in thirty-two from various villages in the Sipolilo Native Reserve were examined and it was found that 90 per cent. were infected (18 positives in 20 head). The incidence actually tends to be higher in ranch and native cattle than in dairy cattle.

It is therefore apparent that the disease is practically ubiquitous in all conditions and breeds of cattle if the above figures from Mashonaland are respresentative of the Colony as a whole. Former beliefs as to distribution appear to have been based on very incomplete observation generally confined to dairy cattle.

3. The Significance of Contagious Granular Vaginitis as a Causative Factor of Sterility.

Contagious granular vaginitis is so prevalent in sexually mature female bovines (more than 90 per cent. of observed animals being diagnosed as positive) that it is reasonable to assume that the disease in its ordinary course does not seriously or permanently affect the potential fertility of the animal. This general observation was supported by the investigation of herds in which the breeding history was accurately recorded (Herds A., B., C. and F.). The existence and the relative severity of the disease appeared to have no relation to the breeding history whatsoever. In herd A animals which bred regularly during two years under observation showed every degree of the condition from severe inflammatory lesions to a few isolated nodules. Certain cows in this herd and in other herds showed marked and unusually persistent lesions while continuing to breed with regularity. Herds B. and F. were all known regular breeders with one exception.* In herd C. the average calf crop was from 75 per cent to 80 per cent. which is a good average for ranch cattle. The twelve native cows examined at Sipolilo had calves at heel, with two exceptions, and one of these was heavy in calf. Quinlan (1929) draws attention to the prevalence of sterility in highly bred cattle as compared with indigenous stock, due it is assumed to artificial conditions of husbandry associated with high milk production and fattening for show purposes. Such conditions which induce concentration and widening of contact between animals also favour the dissemination of diseases which are a disability to normal breeding. In view of the fact that vaginitis has a general distribution under all conditions of husbandry and irrespective of race the disease cannot be regarded as a cause of sterility operating particularly on highly bred and pampered types of cattle. The undoubtedly higher incidence of sterility in such animals, on this evidence, cannot be referred to vaginitis for its causation since the latter is a factor common to all classes of cattle.

These findings are in support of the arguments advanced in the opening discussion of this paper. Consideration of the physiological and pathological phenomena associated with successful impregnation of an infected female results in the conclusion that vaginitis is unlikely to prove a disability to normal reproduction except possibly in very rare cases. When vaginitis is diagnosed in a

* See appendix.

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sterile cow the cause of sterility should be looked for elsewhere in the reproductive system. It may be concluded that for practical purposes the incrimination of vaginitis as a cause of sterility is not justified.

4. Miscellaneous Observations.

A. Course and Age Incidence. The disease runs an undulant course exhibiting varying degrees of severity, frequently with periods of complete quiescence when no nodules are demonstrable. It is therefore the rule to find on the examination of an infected herd both severe and mild cases. Hess (1921) states that the disease is met with in an acute and chronic form, seventy-five per cent. of the cases usually being chronic. The high incidence of the disease in calves was rather striking. Williams (1921) states that in American dairy herds calves develop vaginitis " at from four to twelve weeks of age and from that time through adult life present a series of interesting vacillations of intensity so great that various writers have designated the disease as acute, subacute, chronic, cured, sound, etc." Though the course of vaginitis in different individuals is subject to wide variation there is a distinct tendency for the lesions to be most severe in calves and young animals with gradual diminution of intensity in the latter recurrences of the disease. Williams (1921) also notes a decline in the severity of the condition with successive parturitions. Exceptions to this rule were occasionally encountered in old cows in Southern Rhodesia. One of the most severe cases occurred in an aged cow over sixteen years old. This animal produced a calf annually and was in calf when she died in 1934. Experimental cows and heifers constantly stabled and prevented from breeding exhibited the same irregular periodicity and individual variation as milk cows and others breeding and grazing under the usual veld conditions.

B. Transmission. The ætiology of contagious granular vaginitis remains obscure though the condition has been variously ascribed to streptococcal infection (Ostertag 1901) and to diplococcal infection (Ispolatow 1929). Quinlan et Al (1929) were not successful in effecting transmission with vaginal exudate from active cases or in isolating a convincingly causal pathogen. It is believed that the exudate is non-infective after the primary acute phase has subsided. It does not appear to be known what degree of active immunity may be acquired as a result of previous infection. Immunity, if it exists, might have a very definite bearing on negative results of transmission experiments. The prevalence and the severity of the condition in calves has been referred to and the fact that the course of the disease is characterised by periodic marked phases separated by phases of quiescence when even the nodules of the chronic variety may disappear. These facts may point to a variable degree of transient immunity periodically breaking down in the presence of a ubiquitous pathogen.

The bull under natural conditions has been customarily believed to transmit the disease mechanically from infective to susceptible cows. This however is not the only means of transmission since vaginitis is common in calves sexually

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immature. In herd B., four out of nine heifer calves were infected. Their ages ranged from one year to five months. They were stabled separately having no contact with the bull or with cows. In herd A. grade Sussex heifer No. 288 (born June 1933) was hand-reared, her dam dying immediately after parturition. No. 288 was isolated from birth in a loose-box and when seven months old she was found to be infected with vaginitis. Williams (1921) making similar observations on the occurrence of the disease in isolated calves, suggests that infection was acquired through the medium of raw milk fed to the calves. He claims to have checked the appearance of the disease in experimental calves, both male and female, until the first service by feeding them on boiled milk. Quinlan et Al also suggest the possibility of infection by way of the alimentary canal. It is certain that in a considerable percentage of cases the disease is not contracted as a result of the service of an infective bull. As in the case of contagious abortion the importance of the male as a disseminating agent has been over-emphasised.

C. Clinical and Histological Morphology of Lesions. The nodules associated with contagious granular vaginitis occur in the vulva most frequently and in greatest profusion ventrally and ventro-laterally, particularly in, and adjacent to, the fossa clitoridis. A few nodules may occur on the vulva elsewhere and very rarely in the vagina proper. On the latter sites their distribution tends to be rather diffuse. In the more marked cases the nodules frequently appear to have a linear disposition, the lines radiating from the ventral labial commissure and fossa clitoridis. Williams suggests that the linear arrangement is conditioned by the rugosity of the vulvar mucosa. The number and appearance of nodules present is very variable reflecting the undulant nature of the infection. Owing to this variability it was decided that for the purposes of recording results various degrees of severity should be roughly defined and represented by symbols. Thus " 5+ " to " 2+ " indicate degrees of clinical severity while " tr " indicates a case in which rare and sometimes indistinct nodules are present. The status of the " tr " cases was regarded as uncertain until histo-pathological comparison of isolated nodules from such cases were made with nodules from a marked " 5+ " case and from a bull. The microscopic structure was identical in both types of case and in the bull. Clinically the disease in its more severe forms is readily recognised. On parting the labia the nodules are clearly visible on the otherwise smooth mucous membrane as small circular prominences from 1 to 2 mm. in diameter. On digital palpation they are hard and non-vesicular. The elevated centre of the nodule is generally pale in colour while the peripheral zone is reddish and inflammatory. The degree of peripheral inflammation is variable depending on the phase of the disease. Further, this strictly local inflammation may be obscured by a general inflammation associated with parturition or by the physiological changes of the œstrus cycle which are marked by increased vascularity of the vulva. In the acute phase the nodules become more numerous and typically massed together in groups with coalescence of the individual peripheral inflammatory zones. In the majority of cases observed marked

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inflammation was confined to the proximity of these groups of nodules the diffusely nodular areas appearing to be only slightly inflamed. In a few cases the entire mucosa was markedly inflamed and sometimes œdematous.

The discharge from observed uncomplicated cases of contagious granular vaginitis is not copious. It tends to become inspissated and to adhere in yellow crusts to the muco-cutaneous junction of the labia and to the hair pendant from the ventral commissure. The urogenital sinus is the port of exit for numerous secretions and discharges normal and abnormal which may be concomitant but not otherwise associated with contagious vaginitis. The mucous membrane of the genital mucosa undergoes very marked cyclic changes reflecting the cyclic periodicity of œstrus (Hammond 1927, Cole 1930). These normal mucosal changes are associated with marked changes in the quantity and consistency of uterine, cervical and vaginal secretions (Woodman and Hammond 1925). Thus copious ropy or fluid mucous secretions, leucorrhœa and hæmorrhage may all be associated with normal œstrus phenomena in the cow. The mutation of mucous content in the vagina has been recorded by numerous physiologists. Hammond ascribed the white coloration of vaginal discharge to the presence of leucocytes. Frei and Metzger (1926) also observed a marked leucocytic invasion of the vaginal lumen. Leucocytes appear to invade the vaginal epithelium and escape by causing a disruption of the epithelium. Hæmorrhagic discharge is associated with apparently normal œstrus whether service occurs or not. The condition is due to extravasation of erythrocytes particularly from that portion of the vagina immediately anterior to the urethral orifice.

Non-specific vaginitis may result from coital injuries. Parturient injuries are universal in all normally breeding animals and occur with variable severity. Destruction of superficial epithelial tissues may supply atria for secondary infections. Dystokia may cause severe injury and resultant gangrene. Retention in the vagina of uterine discharges associated with abortion, retained placenta and endometritis cause severe irritation. Posterior extension of cervicitis is not infrequently responsible for severe inflammation of the vagina. Fœtal vestiges of the Wolffian ducts (canals of Gartner or Ductus Eoophori Longtitudinales) are occasionally the site of cyst formation associated with vaginal infections.* Irrational and disastrous treatment of sterility and contagious vaginitis by vaginal douching with irritant solutions of disinfectant causes severe inflammation of the mucosa. Quinlan states that " vaginitis in an acute form, which is most usually associated with bad hygiene, carelessness in sex hygiene and irrational treatment may cause temporary sterility and frequent returning to the bull." Animals exposed to such unfavourable conditions and subjected to irrational " treatment " for sterility would develop non-specific vaginitis and would be effectually rendered sterile.† Contagious vaginitis could only be regarded as a relatively slight

* Records of post-mortem material show that about 5 per cent. of cows have vaginal cysts of this nature (see footnote (2), page 186.)

† See Herd I. Appendix.

contributory lesion probably undergoing exacerbation as a result of severe local irritation. It could not be regarded as a major or causal lesion of the local or general condition of the animal.

In determining the extent of the disease process in specific vaginitis the numerous conditions described above should be carefully excluded. In my opinion many of the severe symptoms commonly referred to specific vaginitis are in no way attributable to that disease.

D. Histological Pathology of the Nodules. The nodule is marked by an elevation of the epithelium under which is massed an accumulation of round cells resembling mononuclear lymphocytes (Thoms 1906). The epithelium overlying the summit of the nodule is of a markedly squamous form by comparison with the normal epithelium at this level of the vagina. The pressure of the underlying cellular mass which tends to invade and oscure the deeper epithelial layers appears to cause a thinning of the epithelial covering. At the circumference of the nodule the eipthelium tends to be abnormally thick due to a localised hypertrophy and enlargment of the component cells of the epithelium. The epithelium of the nodules is liable to undergo excessive desquamation or erosion as a result of mechanical injury, and it is not infrequent to find that such a nodule has discharged a proportion of its cellular content into the lumen of the vagina. The cellular mass contained within the nodule is non-vascular and shows no tendency to invade the subjacent stroma. In association with nodules from more acute cases a localised hyperæmia of the adjacent stroma frequently occurs.

The nodules which occur in mild or quiescent cases and those which occur in more acute cases are histologically identical. To conclude the histological observations on contagious granular vaginitis, material was obtained from an infected bull. The nodules occurring on the penis of this animal revealed an essentially similar structure to those occurring on the vaginal mucosa of the female thus indicating that the typical nodule is not a normal histological structure peculiar to the vaginal mucosa of the cow.

E. The Status of Typical Nodules as Pathological and Specifically Diagnostic Lesions. The question has been raised as to whether the nodules typically associated with vaginitis are normal anatomical structures and not pathological lesions (McFadyean 1900, Webster 1932, Edwards 1933), or variously that they are not specifically diagnostic for contagious granular vaginitis. (Zschokke 1900, Ostertag 1901, Quinlan et Al. 1929). These authorities appear to base their diagnosis on the presence of nodules only when the nodules are accompanied by inflammation and a rapid dissemination of infection in an affected herd. It is generally admitted, however, that the disease is characterised by a vacillating course and that in examining affected herds acute, chronic and very slight cases are met with (Hess 1921, Williams 1921). The chronic stages of the disease are not characterised by inflammation but by the presence of nodules in variable number. The microscopic appearance of these nodules in mild and chronic cases identifies them with acute cases. Furthermore in all the herds

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examined during the present investigation the incidence of the disease was high. The suggestion that the nodules are normal structures or non specifically diagnostic appears to be contradicted on the following grounds. The nodules present a clearly abnormal appearance when the nature of their occurrence in marked cases of vaginitis is considered. The nodules also occur in the infected male. The acute form of the disease in that sex is similarly characterised by numerous histologically identical nodules. Until more convincing experimental evidence was forthcoming there might have been grounds to assume that the nodules, if confined to the vulva, were normal structures, or, at least not pathognomonic lesions of vaginitis. The occurrence in the infected male, however, should establish the status of the nodules as specifically diagnostic lesions. The nodules certainly occur contemporaneously with inflammatory conditions other than infectious vaginitis but they should not be regarded as symptoms of the latter diseases.

F. The Advisability of Treatment. In view of the foregoing observations on the incidence and nature of contagious vaginitis in Southern Rhodesia it is felt that the condition in the female rarely warrants treatment and that unless treatment is undertaken with a full realisation of the delicacy and vulnerability of the parts involved a mild localised infection may readily be supplanted by a condition definitely and often permanently inimical to reproduction. Therapeutic measures generally are contra-indicated for the following reasons. In the first place there is no evidence to show that typical contagious vaginitis has any adverse effect on the general health or the fecundity of the affected animal. Secondly, unless strict asepsis is observed and rational selection of drugs is employed the results of treatment are infinitely more harmful than the original disease against which these measures were directed. Herd I., in which animals were treated for contagious vaginitis by vaginal " douching with a strong solution of perchloride of mercury, affords an example of the extremes to which so-called treatment can be carried and the disastrous sequelæ which result therefrom. Thirdly, contagious vaginitis appears to be practically ubiquitous and attempts at treatment or control on a large scale would be as futile as they are unjustifiable.

Under exceptional conditions where treatment may be undertaken it should be carried out by a veterinarian. The layman cannot be depended upon to observe strict asepsis or accuracy in the preparation of irrigants. Such diseases as contagious abortion, tuberculosis and non-specific septic conditions affecting the uterus are readily disseminated by careless treatment and handling.

Summary and Conclusions.

(1) A brief historical survey of the subject is made referring to the diversity of professional opinion regarding contagious granular vaginitis and the increasing tendency to minimise its ætiological significance in association with sterility. The application of pathological and physiological data to problems of sterility, particularly with regard to contagious abortion, hormonic aberrations and mal-

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nutrition have placed the ætiological study of sterility on a more rational biological basis. A minority, however, still exist who adhere to the earlier beliefs regarding the malignancy of contagious granular vaginitis.

(2) Theories attempting to explain the exact nature of the inibition imposed on normal reproduction by contagious granular vaginitis are discussed. It is concluded that these theories are not convincing nor are they supported by the evidence collected during the present investigation.

(3) Contagious granular vaginitis was found to be very prevalent in herds free from contagious abortion. The former disease is not a symptom of the latter nor have they any common pathogen.

(4) Contagious granular vaginitis was found to occur in all herds examined irrespective of breed or of the widely variable conditions of husbandry to which these herds were subject. Contrary to expectation the disease occurred with the same frequency in ranch and native cattle as in dairy cattle.

(5) Contagious granular vaginitis appeared to have no part in the causation of sterility. The disease occurred in animals breeding regularly and normally. The undoubtedly higher incidence of sterility in well bred cattle is not due to a higher incidence of contagious granular vaginitis. The latter condition seems to be practically ubiquitous appearing with similar frequency and severity in all classes of cattle.

(6) The disease runs an undulant course. There is a tendency for the lesions to be most marked in calves, a gradual decline in intensity occurring with age. There are many exceptions to this rule.

(7) The ætiology of contagious granular vaginitis remains obscure. It is suggested that variable degrees of immunity have a bearing on the negative results of transmission experiments. The importance of the bull in the mechanical transmission of the disease has been much exaggerated. The occurrence in calves and isolated females suggests the probability of an alimentary atrium of infection.

(8) The macroscopic nature of the lesions of contagious granular vaginitis is described. Physiological changes associated with œstrus should not be confused with the symptoms of vaginitis. Normal œstrus may involve copious discharge of mucus, leucorrhœa, hæmorrhage, etc. Similarly non-specific vaginitis is referable to many common causes having no connection with the specific condition. Many of the severe symptoms commonly referred to contagious granular vaginitis are in no way attributable to that disease.

(9) The " nodules " typically associated with contagious granular vaginitis are specifically diagnostic lesions. They are not normal anatomical structures of the vaginal mucosa since they occur on the external genitalia of the infected male.

(10) The disease rarely warrants treatment in view of its benign nature and the fact that unless treatment is carried out with meticulous care the results will be infinitely worse than the original disease.

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Appendix

DETAILS are given in this appendix of the numbers of cattle examined, the incidence of Contagious Granular Vaginitis and other relevant observations.

Herd A. Veterinary Research Department experimental herd. This herd was examined clinically for contagious granular vaginitis and tested for contagious abortion at intervals during a period of about two years (Sept. 1933—June 1935).

ANIMAL	REMARKS ON CONTAGIOUS GRANULAR VAGINITIS
No. 240 Gr. Sussex heifer. ...	Slight case becoming marked (5+) during several months following calving.
No. 247 Gr. Jersey heifer. ...	Marked before and after calving.
No. 253 Gr. Cow. ...	Calved twice while under observation; disease undulant course apparently not associated with reproduction.
No. 251 Gr. Sussex heifer. ...	Calving appeared to have little effect on undulant course.
No. 252 Gr. Sussex heifer. ...	Calving appeared to have little effect on undulant course.
No. 243 Gr. Sussex cow. ...	Mild case throughout; two calves while under observation.
No. 250 Gr. Sussex cow.	Mild case throughout; one calf while under observation.
No. 249 Gr. Jersey heifer.	Marked case for five months following calving (died 12/11/34).
No. 208 Gr. Sussex heifer.	Marked undulant case before and after calving.
No. 206 Gr. Sussex heifer	Marked undulant case before and after calving.
No. 248 Gr. Sussex heifer	Marked undulant case; two calves while under observation.
No. 259 Gr. Sussex heifer	Negative before calving; severe for some weeks after calving showing gradual decline.
No. 241 Aged cow	Produced no calves during period of observation, probably due to old age and debility; mild undulant case throughout.

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Animal	Remarks on Contagious Granular Vaginitis
No. 244 Gr. R. P. heifer	Mild undulant case throughout; two calves while under observation.
No. 242 Gr. R. P. heifer	Mild undulant case throughout; two calves while under observation.
No. 245 Gr. cow	Produced no calves during period of observation due to old age and debility (died 11/10/34). Mild undulant course throughout.
No. 246 Old native cow	Marked case throughout; regular breeder.
No. 289 Pedigree Fries. cow ...	June, 1933, a marked case; treatment with "Vaginaline" 22/6/33—31/7/33, reduced condition to "tr." Non-specific vaginitis later set up by persistent metritic discharge; died 26/10/33; P.M. chronic endometritis and atrophic ovaries.
No. 264 Native yearling heifer ...	Marked case (sold 7/6/34).
No. 265 Gr. yearling heifer	Marked case. (Sold 7/6/34).
No. 293 Gr. R. P. yearling heifer ...	Mild case. (Sold 7/6/34).
No. 269 Gr. R. P. yearling heifer ...	Marked case. (Sold 7/6/34).
No. 266 Gr. R. P. Jersey heifer ...	Marked case when conception occurred and during pregnancy; mild following calving.
No. 268 Gr. R. P. heifer	Marked case. (Sold 6/12/34).
No. 255 Gr. R. P. heifer	Marked case. (Sold 7/6/34).
No. 292 Gr. R. P. heifer	Mild case. (Sold 7/6/34).
No. 297 Gr. heifer calf	Negative. (Sold as yearling 6/12/34).
No. 299 Gr. heifer calf	Negative. (Died at 3½ months of age, 5/2/35).
No. 288 Gr. Sussex heifer calf ...	Born June, 1933; hand-reared from birth and isolated in loose box; at 7 months of age a marked case. (Died, 9/2/35).
No. 301 Gr. heifer calf	Severe at 12 months of age.
No. 258 Old Gr. cow	Stabled; regular breeder; slight "tr." persistent. (Died, 28/9/34).
No. 287 Gr. heifer calf	Severe at 12 months of age.
No. 205 Gr. heifer	Mild case before and after first calf. (Shot, 14/10/34)
No. 254 Gr. heifer	Mild case before and after first calf.
No. 313 Gr. heifer.	Marked undulant; stabled expt. heifer prevented from breeding.
No. 290 Pedigree Fries. cow ...	Persistent trace. Sterile due to salpingitis and chronic endometritis; diagnosis confirmed on P.M., 8/7/34.
No. 306 Gr. heifer	Marked undulant; stabled expt. heifer prevented from breeding.
No. 209 Gr. heifer	As above see No. 306.
No. 207 Gr. heifer	As above see No. 306.
No. 317 Gr. calf	Slight case at 5 months of age (4/12/34). Died, 13/1/35.
No. 321 Gr. calf	Marked case at 7 months of age.
No. 323 Gr. calf	Slight case at 6 months of age.
No. 324 Gr. calf	Negative case at 5 months of age.
No. 325 Gr. calf	Slight case at 6 months of age.
No. 326 Gr. calf	Negative case at 1 month of age.
No. 327 Gr. heifer calf	Marked case at 6 months of age.
No. 329 Gr. heifer calf	Negative case at 5 months of age.
No. 307 Gr. heifer	Marked undulant case; stabled experimental heifer prevented from breeding.

During the period of observation all potentially breeding females produced one or two calves with the exception of the following: Nos. 289 and 290 which were sterile due to endometritis, etc., and Nos. 313, 306, 209, 207 and 307 which were stabled throughout the whole period and prevented from breeding. (Nos. 241 and 245 failed to breed as a result of age and debility.) No case of non-breeding was therefore obscure as to its origin nor could it be referred to contagious granular vaginitis.

The herd was known to be free from contagious abortion as several serological tests of all animals were carried out and further supplemented by isolated tests of individual cows recently calved.

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Herd B. Examined and tested 25/1/35. In this dairy herd the breeding history was satisfactory throughout with the exception of one cow. This cow was thoroughly examined, clinically on two occasions and a diagnosis of chronic endometritis arrived at (24/1/34 and 31/5/34).

Cows: Total examined 30; 1 negative; 1 doubtful; 28 positive.
Percentage infected: 90 per cent.
Average severity in infected animals: 2.07+.

Calves: Total examined 9; 5 negative; 4 positive.
Percentage infected: 44 per cent.
Average severity in infected animals: 2.50+.
Agglutination tests for contagious abortion were all negative.

Herd C. Examined and tested 6/8/35. In this herd the breeding history as recorded over a period of years had been very satisfactory. Owing to the large number involved representative lots were selected from each mob for examination and testing. The herd is maintained under typical ranching conditions. (Breed Sussex).

Mob A. Grade cows and calves.

Cows: Total examined 24: 1 negative; 23 positive.
Percentage infected: 96 per cent.
Average severity in infected animals: 2.74+.

Calves: Total examined 11: 1 negative; 10 positive.
Pecentage infected; 91 per cent.
Average severity in infected animals: 3.70+.
NOTE. The age of the calves ranged from 8 to 10 months.

Mob B.: Pedigree cows and calves.

Cows: Total examined 36: 2 negative; 34 positive.
Percentage infected: 95 per cent.
Average severity in infected animals: 2.56+.

Calves: Total examined 6: 1 negative; 5 positive.
Percentage infected: 83 per cent.
Average severity in infected animals: 4+.
NOTE. The age of the calves ranged from 8 to 10 months.

Mob C.: Heifers.
Total examined 25: 6 negative; 19 positive.
Percentage infected: 76 per cent.
Average severity in infected animals: 2.58+.

Herd D. Examined and tested 17/8/35. In this herd (approximately 800 head) the calf crop had been unsatisfactory during the preceding season and contagious abortion was suspected to be the cause of the low reproductive rate. Twenty-five samples of blood were collected for testing, two of which were positive (contagious abortion) (8/9/34 and 14/11/34). The herd is maintained under typical ranching conditions.

Cows: Total examined 32: 3 negative; 29 positive.
Percentage infected: 91 per cent.

The fact that the suspicion of contagious abortion was confirmed by serological test further supports the assumption that the low reproductive rate was due to that disease.

Herd E. Examined and tested 17/8/35. This herd consisted of numerous small mobs of native owned cattle from various villages in the Sipolilo Native Reserve. These animals were concentrated at Sipolilo for examination by the courtesy of the Native Commissioner. Among twenty samples of blood collected for testing one was positive (contagious abortion).

Cows: Total examined 12: 2 negative; 10 positive.
Percentage infected: 74 per cent.
Average severity in infected animals: 3.30.+

Heifers: Total examined 5.
Percentage infected: 100 per cent.
Average severity in infected animals: 4.40+.

Calves: Total examined 3.
Percentage infected: 100 per cent.
Average severity in infected animals: 4.66+.

These cattle were all in excellent condition. The majority of the cows had calves at heel.

There is a popular belief that the incidence of contagious abortion in native cattle is very low If this disease were looked for in native areas, however, it would probably be found to be fairly prevalent. In Northern Rhodesia the disease is widespread throughout the native stock of the colony. In East Africa contagious abortion is similarly common and has been recognised among indigenous natives for many generations.

Herd F. Examined by the Director of Veterinary Research (1930). This herd consisted of about thirty pure bred dairy cows (Frieslands) about 35 per cent. of which were found to be

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grossly infected with contagious granular vaginitis. The breeding history of the herd was satisfactory in every way. The herd was free from contagious abortion.

Herd G. Examined by the Director of Veterinary Research (1935). This herd consisted of twenty-five dairy cows all of which were infected with contagious granular vaginitis. The majority were marked cases.

Herd H. Examined 3/6/35. Cows from several mobs of ranch cattle were examined: about 90 per cent. were infected with contagious vaginitis.

Herd I. Examined 27/11/35. The sixteen animals examined had been removed with others from the main dairy herd by the owner with the idea of subjecting them to treatment for vaginitis. Several of these animals were " shy " breeders or were believed to be sterile. Clinical examination revealed marked lesions of vaginitis and the low reproductive efficiency of the cows was referred to this condition. The treatment recommended by a so-called " veterinary adviser," consisted of " douching " the vagina with perchloride of mercury solution every second day for two months. The owner commenced faithfully carrying out his instructions though very soon he became alarmed at the severity of the symptoms produced and was readily amenable to advice when he consulted this Department. Treatment was accordingly discontinued.

The symptoms as described by the owner were violent straining during " douching " becoming more marked and prolonged as the course of treatment progressed, pain and straining associated with micturition, severe inflammation of the vaginal mucosa, the occurrence of " sores all over the body " but which were most marked on the external genitalia and adjacent perineum and on the buccal mucosa with gingivitis and ulceration, the owner also made particular reference to lesions on the belly, excessive salivation was evoked, the gait was unsteady and weakness of the hindquarters became increasingly pronounced, several cases became blind, falling off in condition and in the case of cows in milk rapid decline in milk yield occurred, several going dry.

Three animals died as a result of treatment. The symptoms described suggest mercurialism due to the local escharotic effect of the perchloride and to the absorption of the drug through the vaginal mucosa. The dilution of perchloride recommended and actually employed in the above treatment was 1 in 2,000. " Douching " was further supplemented in certain cases by the insertion of vaginal pessaries also containing perchloride of mercury (1 in 1,500). A dilution of 1 in 100,000 is suitable for vaginal injection.

Treatment was discontinued towards the end of September and about two months later the remainder (16) of the treated animals were examined clinically (27/11/35).

In every case the local lesions were almost identical, the labial mucosa was of a dull dark red colour, swollen, puckered and scarred. A few typical pale nodules were present in most cases and were of the quiescent type. In five animals selected for detailed clinical examination of the genitalia the anterior part of the vagina was markedly fibrosed. In one of the latter cases the vaginal lumen was so markedly constricted by fibrous tissue as to render palpation of the cervix *per vaginam* impossible. In a second case the vaginal lumen was partially occluded by several fibrous adhesions. In the remaining three animals thus examined the cervix was palpable and appeared to be indurated and involved in the general fibrosis affecting the vagina.

As a result of this barbarous treatment it is highly improbable that any of the treated animals will again become impregnated or in such an event that they will have a normal parturition.

THE LAW RELATING TO VETERINARY PRACTITIONERS IN AMERICA *

By MURRAY JENKINS, A.B., M.A., LL.B., New York

THE best part of any address that I may make to you will be in certain questions that have been propounded to me in writing by certain ingenious members of your profession. They apparently wanted to try me out, and to these questions I have typewritten answers and they may be examined later if you see fit. All of these questions are far more important to you than anything I say in a general manner. All men are subject to the laws of this country, although sometimes these laws, particularly recently, are somewhat obscure, somewhat hard to

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understand. Even our Supreme Court of the United States has a playful habit of dividing five to four and yet we are supposed to know the law.

The law relating to your profession is exceedingly simple. It is the law of reason, the law of custom, the law of common practice. Very few states have attempted to outline what a veterinarian should do and what he should not do. The law is more or less left to the general practice as understood by the profession. That is in accord with English law.

I speak of English law because the law relating to your profession has as its direct ancestor the English common law. When the Colonies broke loose in Revolutionary times they carried over the common law. That law is often referred to as the Unwritten Law. That is a misnomer. There are two kinds of law. One is statute law. Statute law is a law which is passed by a legislative body. The common law, on the contrary, is never passed by any senatorial or congressional or any other form of representative. It is the law that has grown up with you and me and with our ancestors before us even to the fortieth generation. It is the law which pertains to the common man and the common business man, the common professional man. What are his activities? What is his custom? What do they do or what do we do in any given circumstances? Such is the common law. But it is written law for this reason. Judges or Appellate Courts composed of more than one judge write opinions and they construe given facts and derive certain principles of law therefrom.

That is the law that I refer to as the law of custom and ordinary practice. For example, if a certain ailment of a patient is customarily, almost universally, treated in a certain manner although the law may never have passed upon that question—if two or three members of your profession in good standing with good qualifications and of good appearance and learning take the witness stand and they say, "Why, what Dr. A. B. and C. did was the common practice of our profession when confronted with these symptoms"—that being the law of the case, the Court adopts that rule of law. If the case goes up on appeal, there is a decision which authenticates the adoption of that particular practice.

Your profession is not a stale profession. It is a growing profession and, oddly enough, statute law is a stalemate, to use a term, whereas common law is a progressive law. Only some thirty or thirty-five years ago the first chauffeur in the United States appeared. There was no law saying who was or who was not a chauffeur. We adopted a French word and there came a number of decisions describing what a chauffeur was, what his duties were, how he should drive a car, what knowledge and experience he should have before he went on the highways. So the common law picks up the advance of any science, the advance of any trade, the advance of any industry, and adopts the common understanding concerning that trade or the individual who indulges therein. That is the particular law that affects you men in your profession.

Now, I want to say this. The common law has as its basis the rule of reason, the rule of common sense, the rule of custom. If you do what the better men do

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in your community, and when I refer to the better men I mean the better men of your profession, you will be sustained in whatever you do by the law courts. Almost all courts in the United States, and surely in those states which are represented here to-day being the eastern states, will sustain you. You will be sustained in these common law courts.

The judge doesn't look for a statute. He doesn't look for a regulation. He doesn't seek to find the technicality. The judge in ruling on the law looks to see what professional men in good standing in that profession there are and then he decides that he will charge the jury in accordance with what the members of your profession have told him is the custom. The law does not expect every man to have the qualifications of those gifted few who by rare attainments, extra study, or because of unusual talent excel others. The law doesn't expect you to have the knowledge, the experience and the skill of a man who has written a great work and who has perhaps spent forty years developing all the technique of that work. You don't have to know everything, but the law does expect you to have the average skill, the average knowledge, the average ability of an ordinary practitioner of your profession in your state or as the law usually calls it in your community.

Now, I think I can develop this question of what the law is relating to the mal-practice or non mal-practice of your profession by referring briefly to a number of questions that have been submitted to me at my request in order to make this subject a practical one. I won't in each instance enumerate or name the author of these questions. I have received quite a number of questions directly pertaining to the practice of your profession with requests that I answer what the law would expect of the practitioner in that given instance, and with your permission, gentlemen, I shall read some of these questions and the answers thereto.

First of all I have this question: What is the relative position or comparison in a court of law of the legally qualified practitioner who is not a member of his local, state or national veterinary medical associations as compared with the man who is a member of all three in good standing?

My answer briefly is this: In a court of law, the member of a well recognised veterinary medical association is recognised as an expert with regard to all matters of his profession. His opinions are valued and treated with respect. The practitioner who is not a member of any professional society may qualify as an expert through special knowledge and experience, but his opinions, while accepted, do not carry considerable weight.

The reason for this comment is obvious. Your profession is advancing all the time with new methods, the use of new ingredients and is expanding with scientific accumulated knowledge. The courts recognise the value of association among practitioners, the discussion of their problems among each other and the mutual imparting of special knowledge from one to the other. The non-professional man misses these contacts, which lessens the probative value of any evidence he gives on the witness stand.

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I trust the gentleman who submitted that question finds the answer because I have thought over that quite a bit. I have used my experience not only with your profession but with the allied professions of medicine, dentistry, and so on.

The next question I have selected is: What is the liability of a legally qualified practitioner, in good standing in the profession, in reference to (*a*) accidents resulting in death of the patient; (*b*) unsatisfactory results or outcome of operations; (*c*) injuries resulting from struggling and violence due to confinement rather than the operation itself; and (*d*) post-operative sequelæ which may result in death of the patient? Is it necessary for a practitioner of this standing to secure a release from the owner absolving him from liability in such cases?

Now, you must grant, Mr. Chairman and Members, that that is some question. I have tried to separate that and answer it in the following form: You will recall (*a*) was accidents resulting in death of the patient and my answer to that is this: Accidents are of two kinds—accidents resulting from negligence and accidents that are not the result of negligence; accidents resulting from negligence renders the legally qualified practitioner in good standing liable for the damage done. A mere accident without negligence does not render him liable.

In other instances I have been asked, " What does the word ' negligence ' mean? " Well, The Supreme Court of the United States has tried to describe it. The Court of Appeals of this state has, and the highest court of every state in the union has, attempted to give a definition. With great respect for all of them and admitting great inferiority on my own part I will attempt one now. It is the want of ordinary care under the circumstances presented. For example, a man may drive an automobile at seventy-five miles an hour on certain highways in the United States with comparative safety and yet down on the docks of New York here at eleven o'clock this morning or to-morrow morning to drive a car six miles an hour may be negligent. It depends on the circumstances presented.

A veterinarian is liable when he is negligent, when he lacks care, when he lacks caution and prudence. He is not liable simply because something goes wrong. To quote from the old English axiom, " Accidents happen in the best regulated families."

Now, take (*b*) which you will recall was the liability of a legally qualified practitioner in good standing in his profession with reference to unsatisfactory results or outcome of operations. I have answered (*b*) as follows: An unsatisfactory result following an operation that has been performed after careful diagnosis and in an approved manner does not render the practitioner liable. I might add to that answer that you gentlemen when you undertake to treat a patient do not guarantee good results. The law says you shouldn't and luckily for you you don't have to. All you promise by implication is to render clever, able, skillful and competent effort to effect a good result.

A practitioner does not warrant a good result but only promises by implication to render service in an attempt to bring about good results.

Subdivision (*c*) which I will call to your attention again, is what is the liability

of the practitioner with reference to injuries resulting from struggling and violence due to confinement rather than the operation itself? I may say before answering this question that a good deal depends upon the facts of the given case. They may shade one way and they may shade another way. Upon what inquiry is a practitioner when he faces a certain problem particularly with an animal already evidencing violent tendencies? On the other hand, is he put upon inquiry with a docile patient that evidences no excitement or no nervousness?

That can vary from one side to the other with the greatest of ease but the law is very clear in answering that question. Injuries resulting to struggling patients in confinement are sometimes avoidable by the exercise of reasonable foresight and care; sometimes they are not. My answer to this question must be the same as I answered sub-division (*a*) of this general question.

Now, the last part of this question dealt with (*d*) What is the liability of a legally qualified practitioner with reference to post-operative sequelæ which may result in death of the patient? Is it necessary for a practitioner of this standing to secure a release from the owner absolving him from liability in such cases? My answer is: Post-operative care is just as essential as the performance of an operation or the administration of a treatment. If serious misfortune or death occurs to the patient, the practitioner is not responsible provided he has used due care and followed the approved methods. Once again, if he has not been careful, if he has not used standard methods, he may be held liable for failure to do so.

When I say " may be held liable " that usually means a law suit with a judge presiding and a question of fact presented to the jury and the jury's verdict against the practitioner which is reduced to a judgment when the sheriff comes around to see him.

Now, I have this interesting question. Once again I compliment the ingenuity of the gentleman who submitted this question. He was trying me out and I hope I qualified. The question is: In the question of illegal practitioners, is the State Department of Education responsible for their prosecution? If so, what means can be taken to force action? Is the non-licensed individual who is daily engaged in the practice of his profession an illegal practitioner per se? If so, what agency should secure the evidence, the Department of Education, the State or local Society, or the legal practitioner? In the event of prosecution, which agency would have the most weight in Court, the Department of Education or the State Society?

That is the question. I might say that in every state the laws may vary somewhat. As to the licensing of practitioners, as to certain rules governing ability and competence, there may be some statutes that are peculiar to one state and not to another. I would like to have you know that I do not profess to intimately know the laws of any other state than that of New York, where I practice. But I will answer this question in the light of that remark.

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My answer is this: In answering this question, I have in mind that many of my listeners are practitioners in states other than New York. In New York State, the Department of Education is vested by our legislature with the right to admit applicants for the licence to practice veterinary medical surgery. Examiners as to qualification are appointed. These examiners also have the right to recommend the revocation of a licence for misbehaviour on the part of a practitioner and they also have the right to prosecute " quacks " who practice without a licence.

It is not only the duty of a veterinary surgeon to bring matters of this sort to the attention of the examiners, but it is even the duty of a good citizen—a layman—to do likewise. Every profession needs purification through the elimination of tort feasors, frauds and those who resort to illicit activities.

The average citizen, be he professional or otherwise, hesitates to assume the responsibility of setting in motion the wheels of justice for fear that the culprit may prevail in a defence and he be sued by such culprit for malicious prosecution, false arrest, slander, libel or like action. A society or association acting as a whole or through a carefully selected committee is the best agency for the gathering of evidence and the production of such evidence to the State Education Examiners. If the Examiners reject the evidence, it is rare for the aggrieved individual to set up a claim against such association. If he does, he will be confronted with an iron-clad defence and he will lose his case.

To carry the story to its logical outcome, the Examiners being supplied with information are charged with the duty to take action. They in turn present their evidence to the Attorney General of the State, and the actual prosecution is conducted by the office of that high official.

What I have said with special reference to the procedure in the State of New York is substantially true in every one of the states from which there may be practitioners present in this audience.

As this question contains several blended questions, I wish to comment upon that portion concerning which agency would have the most weight in court, the Department of Education or the association. The official department has greater weight. I think, however, that some time State Departments may lag in their prosecution unless spurred on by the society or association. I think in all such instances the society or association should co-operate fully with the appropriate official examining and prosecuting agencies through the association's legal adviser and respresentative.

Perhaps that question has no place in this audience to-day but I think it might be well for you to consider that. Every society, every profession should have as one of its important functions the elimination of quacks, frauds and imposters and get them out of the profession. Honest men who have struggled hard, perhaps, in obtaining their learning and getting admitted to practice should be protected by the elimination of people who haven't gone through what they have nor have they the knowledge.

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Now, here is another question. In the use of remedies and compounded prescriptions to which, through carelessness or mistake, poisonous or dangerous ingredients have been added, who is liable in the event of death or bad effects in the patient, the veterinarian who dispensed the preparation or the manufacturer or druggist who compounded it?

Well, we have got a lot of law on that subject, gentlemen. And the answer will shake your confidence a little bit when I say both are liable. That is the law. The practitioner is responsible for the administration of a poisonous or dangerous ingredient because of his contractual relationship with the owner of his patient, even though he had every rhyme and reason for believing that the compound, prescription or patent medicine was pure, unadulterated and proper in content. The manufacturer, compounder or druggist is liable for his negligence under the Food, Farms and Market Laws of the State.

The veterinarian, however, has an unusual right under these circumstances, and bear in mind in case you encounter this particular predicament, his remedy is this: In the event that he is held liable by his patron he may sue over against the manufacturer, compounder or druggist and recover that which he has been forced to expend as a result of a suit brought against him. I might amplify that a little bit.

When a veterinarian goes to a manufacturer or to a compounder or a druggist he has faith in that concern and has a right to rely upon the fact that they proceeded in the manufacture or compounding of that produce in a legitimate and proper and careful manner and they turned over to him a product which he could safely use. The law doesn't expect a practitioner to analyse every well-known product that he uses in his profession. Nevertheless, he is liable because he has poisoned the patient or harmed the patient. However, once he has been made to pay money on account of the fault of somebody else, the law says he can sue that somebody else and get his money back, so indirectly you escape liability.

Here is the next question: In the use of recognised specific biological products such as sera, vaccine, etc., what is the liability of the practitioner in the case of severe anaphylactic shock and possible death of the patient? My answer to that question is this: If certain biological products have been recognised by the profession as valuable for the treatment of patients, a practitioner is not responsible when an anaphylactic shock results in the death of the patient, provided, nevertheless, his method of administration followed approved methods and the dosage was standard in quantity. If the practitioner errs in either respect, he may be held liable.

Once again, I reiterate that the common law is based upon reason and custom and the advancement of knowledge. The practitioner is protected from liability where he makes a careful diagnosis, uses approved methods and administers or operates in accordance with the accepted standards of his profession.

Now, I have some questions propounded by a gentleman who is both a veterinarian and a lawyer. It is too bad he isn't here because he could do so

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much better than I because he knows both professions. I think, down in Maryland, where he lives, practicing both professions, he is probably having a good laugh at my expense as I try to answer his questions. He has propounded four of them to me and I will give you his questions and my answers thereto. He says, "A client is dissatisfied with treatment administered to his animal by a veterinarian. The veterinarian is disposed to make no charge in an effort to avoid argument and waste of time. Can he do so without weakening his position in the event of a suit for damages claimed to be the result of his treatment?" My answer is this, and I quote from a greater work than we have had in two thousand years: "The servant is worthy of his hire." The veterinarian in his treatment of patients cannot always please their owners; nevertheless, he is entitled to his fee. To waive fees in a worthy case is an honourable act. To waive fees because of fear or an argument or a law suit is unworthy. The doctor's position in a malpractice action brought against him is weakened in the eyes of a court and jury if he waives his fees. I might go so far as to say not legally, but truly, it is taken as an admission of guilt.

The next question is: A veterinarian treating a horse which requires restraint is assisted by the owner. A third party volunteers assistance and his activities in rendering same are directed by the veterinarian. The third party is injured while so assisting. Is the veterinarian liable to the third party? Is the owner of the animal liable to the third party? Perhaps some of you gentlemen have faced just that situation. Well, here is my answer.

The veterinarian is not liable for injury to a third person who voluntarily attempts to restrain a struggling patient. Neither is the owner of the patient liable to such third party. The reason is obvious. The third person, by volunteering, assumes the risk of so doing. One of the oldest maxims of the common law is contained in the Latin quotation, "*Volenti non-fit injuria.*" Translating this expression liberally, the maxim may be read as "He who thrusts himself into peril must stand the consequences." That is very literal. It is as literal as I used to translate Cæsar in college.

Here is the third question that this lawyer veterinarian asks me to answer this afternoon: A veterinarian wishes to use a therapeutic agent recently placed upon the market in the treatment of a certain case. He has never used the product before and has never seen it used. From the available literature he believes the new product is indicated in the case at hand. In order that he may be protected in the event of unfortunate results, is he bound to disclose the above facts or may he act upon his own judgment?

That is the only easy question that this gentleman gave me. The law is very plain, and it is plain not only in this state, but in every eastern state, which I assume are the states solely represented here to-day. The use of new methods of treatment or the use of an untried medicine must be approached with caution by professional men. The Court of Appeals of this state in a very famous opinion used these words—and before I use these words, gentlemen, may I say that these

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words have been quoted probably in thousands of cases pertaining to every learned profession, including law, medicine, engineering, your profession, dentistry, and even pediatrists and chiropractors, every profession you can think of are concerned in these words. I happen to know they have been quoted in every state of the union. A few years ago I wanted to explain that problem in a brief and I found it to be true from California to Florida, from Texas to Maine. This is the law that answers that question, and when I read that question I knew that was one I could answer.

Here is the way the Court of Appeals of this state has said it, and you will notice the very choice and delightful language the Court uses: " The rule in relation to learning and skill does not require the surgeon to possess that extraordinary learning and skill which belong only to a few men of rare endowments, but such as is possessed by the average member of the profession in good standing. Still, he is bound to keep abreast of the times and a departure from approved methods in general use, if it injures the patient, will render him liable, however good his intentions may have been."

The important part of that question is contained in the words, " departure from approved methods in general use." The question presumes that the method of treatment and the medicine to be used are brand new; nobody has tried it out, so that falls right within that phrase of the Court of Appeals of this state which has been adopted and followed by every state in the union. My comments are contained in these words: If the veterinarian in the questions in the exercise of his judgment believes he may obtain a good result by the use of the new product, he should disclose the fact that his treatment will be in the nature of an experiment and he should obtain the consent of the owner of the patient. Assuming he does not disclose the facts and the experiment turns out unsuccessfully, he would be held liable for any consequential injuries.

That is in accordance with the common law. If you are going to experiment in your profession, do it collectively. Don't put the burden on any one man, because if he has a bad result he has moved away from the accredited, approved, accepted method of practice and he has done something new. A very apt answer from any one of you if I were in private discussion with you would be to say to me, " Well, how does the profession ever grow if you don't try out something new? How has the profession arrived at this standard by which you gentlemen practice? How did it get there? How did it happen if new things weren't practised and tried out?"

Of course it would never get there. Scientists, discoverers, inventors of new methods and geniuses of your profession should be encouraged to go on, but when they try things out they should disclose the fact, obtain consent, try it out with fellowship and combination and not assume a departure from the approved method of practice that the Court of Appeals refers to.

Now, the last question that this gentleman propounds to me is this: A veterinarian undertakes the treatment of a dog, using as much caution as seems

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indicated but not as much as is possible. He is suddenly and unexpectedly attacked by the animal, and in attempting to restrain it and protect himself, the animal is injured. Is the veterinarian liable?

Before I answer that question, I suppose that is probably the most practical question that every one of you will face this afternoon. What is your liability under that set of circumstances? Well, here is the answer. It takes me a long time to read it because it contains just two letters, "No." The law does not require of a veterinarian the utmost precaution nor the very highest degree of care. The law does expect of him the exercise of ordinary caution and reasonable care—the caution and care that is exercised generally by members of the profession in good standing.

Now, gentlemen, I think I have taken up all the time the law of this court permits but I would say this in conclusion: You have a grand profession, increasing in numbers and respect in this community. There are one or two words I would like to give you which apply to all professional men whether your profession is the practice of medicine or anything else. A professional man frequently gets himself, in the vernacular of the street, "in wrong," by posing, by dominating and by claiming—I am still speaking in the vernacular—"to know it all." It is the most natural thing in the world, just as the school teacher domineers a class of pupils. Be tactful. One of your primary objects is to have an unmolested, uneventful and delightful practice in your community. You do not wish arguments. You do not wish claims made against you, and most of all, you do not want law suits. Tact often will avoid a law suit. I hope all of you gentlemen a year from to-day are out of jail and have no judgments against you.

Clinical Articles

DISLOCATION OF THE FETLOCK JOINT IN THE HORSE

By S. SMITH, M.R.C.V.S.

Horsham.

Dislocation of the fetlock joint in the horse is such a rare occurrence that the following case is worthy of notice. The subject was a heavy-weight hunter, aged twelve years.

It was being hand cantered over a grass field when it suddenly collapsed. At first it was thought that the animal had put its foot in a hole, but search of the field revealed no such obstacle. The owner thought that the horse had broken its leg. The animal received professional aid within half an hour, and at the time of attention it was grazing, and in no apparent pain. The fact that the fetlock was dislocated was obvious, and destruction advised. The horse had not been

FIG. 1. DISLOCATION OF HORSE'S LEG.

ARTICLE BY Mr. S. SMITH. PAGE 208.

FIG. 2. POSTERIOR VIEW PERFORATUS REFLECTED.

A. Perforans.
B. Fractured portion of Sesamoid.
C. Tear in Perforatus.

ARTICLE BY Mr. S. SMITH. PAGE 208.

FIG. 3. LATERAL VIEW.

A. Torn Perforatus.
B. Fractured Sesamoid.

ARTICLE BY Mr. S. SMITH. PAGE 208

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unnerved. Twelve months previous to the accident the horse had been blistered in the fetlock joint, and turned out. Up to the time of the accident it had been going well. The post-mortem examination was of great interest. A radiograph of the injured limb was taken and it was seen that the lower end of the large metacarpal bone occupied a position posterior to and inferior to the upper end of the 1st phalanx. There was considerable contusion around the fetlock joint, and extending up the metacarpus. The extensor pedis tendon was ruptured near its insertion. The base of the left sesamoid was fractured. The flexor perforans showed considerable contusion and it was twisted, the twist being almost complete behind the 2nd phalanx in its perforatus covering. The lateral ligaments and the main part of the suspensory ligament were intact. The perforatus was damaged, being torn by the fractured portion of the left sesamoid.

It is strange that such extensive damage should follow a relatively simple false step.

I am indebted to Mr. H. Ede for the X-Ray photographs and to Mr. J. Hancock of the Royal Veterinary College for the photographs.

Abstracts

CONTROL OF HYDATIDS IN NEW ZEALAND

Provisions for checking the spread of hydatids amongst dogs are contained in an amendment to the Dog Registration Act that was passed by the New Zealand House of Representatives in December.

This imposes on local authorities the duty of keeping supplies of approved remedies prescribed for treating dogs infected with the parasite *echinoccocus granulosus*, such remedies to be supplied to dog owners when application for registration is made. The local authorities are entitled to charge an additional fee for the medicine.

During discussion of the amendment in Parliament the Minister of Health acknowledged that the only certain means of breaking the cycle of the disease was for people to give up feeding raw offal to dogs. As compulsion could not be applied in that respect, Government was doing the next best thing. The measure prescribed a form of treatment that had proved successful in Argentina, Nicaragua and Iceland, where the incidence of hydatids has been greatly reduced.

It is gathered that the basis of the medicine is hydrobromide. The amendment will not become operative until the beginning of 1939.

(*The Pastoral Review*)

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AN EPIDEMIC OF ANTHRAX *

By A. J. BRANDT, D.V.M.

Selskap in Oslo.

AFTER an historical survey of previous occurrences of anthrax in Norway there is given an account respecting an epizootic outbreak of the disease in the summer of 1937, which led to the loss of 103 animals and one human life. The live-stock that succumbed to the disease comprised 58 horses, 43 cows and 2 pigs.

It is believed that the origin of the outbreak can be traced back to a cow which had been slaughtered on account of internal hæmorrhage and was afterwards sold as food for foxes on a fur-farm. In a sample of the soil taken from the place where the cow was slaughtered anthrax bacilli were discovered both through inoculation into mice and through direct culture. A week after the slaughtering of this animal the disease broke out in epizootic form and very soon the conclusion was arrived at that insects played an essential part in the spreading of the infection.

What spoke strongly in favour of this conclusion was the fact that the disease, which by degrees spread over a very large area, was largely confined to farms situated on the outskirts of wide stretches of forest, which form the favoured resort of insects. Furthermore, the infection, contrary to custom, attacked more horses than cows, and especially horses that were kept at work at home on the farms in the daytime and for the most part were stabled at night. No proofs of infection through contact or infected pastures could be established in the case of these horses.

Moreover, the disease in horses showed itself in the form of large local swellings at those thin-skinned parts where insects preferably settle, namely, on the chest, in the groin and on udder and preputium (*cf.* illustrations).

The summer was very warm, with unusually many insects, and especially numerous was a large gadfly, which was said by the people of the district to attack horses in particular. In insects collected from the carcases of animals that died from the disease, anthrax bacilli were detected both in cultures and on inoculation into animals.

The swellings mentioned contained large quantities of edematous fluid, but neither by microscopical examination nor in cultures was it possible to detect anthrax bacilli in fluid obtained *intra vitam* through puncturing the swellings. Another remarkable fact was that foals which had sucked in large quantities of edematous fluid from affected udders were in no case attacked by anthrax.

From sick and dying horses blood-samples for bacteriological examination were taken in a great number of cases, but it was not found possible to detect anthrax bacilli in the blood until immediately after death had occurred. Then, however, they were present in dense swarms. If horses were slaughtered immediately before the moment when death must be expected to supervene,

* *Norsk V. Tid., January,* 1938

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no anthrax bacilli, or at most only very scanty numbers thereof, could be found in the venous blood.

On post-mortem examination of horses infected through stings of insects no particular organic changes were found, apart from the local edema at the site of infection and in the regional lymphatic glands. The spleen itself was of practically normal size and consistence.

Likewise some of the cows showed local swellings, especially in the inguinal folds and regional glands, but for the most part the disease in these animals pursued the usual course.

The most important measure adopted for combating the outbreak was the injunction to keep all live-stock indoors and to protect them against insects. In addition to this, prophylatic treatment with serum was widely employed.

The epizootic broke out on the 12th July and reached its climax in the same month. The last case occurred in the beginning of October.

That insects can, both in experiments and spontaneously, convey the anthrax virus is a well known fact, but the textbooks seem to lay no particular stress upon this mode of infection. The epizootic outbreak here described shows, however, that great attention ought to be paid to this matter and that, especially in the warm season, precautions should be taken with a view to the danger arising from insects in case of an outbreak of anthrax.

TROPICAL PNEUMO-ENTERITIS OF CALVES

THROUGHOUT the Tropics and near Tropics, extending well into Brazil, many calves are lost annually from an ailment that appears not to have been described heretofore in the veterinary literature of the United States or Europe. Some of these calves appear very stupid, hence the term *bovera* (or *bobera*) from *bobo*, meaning a fool, is used in some countries. A good many cases show characteristic symptoms of pneumo-enteritis, hence this term is used exclusively in other tropical countries, and apparently refers to the same condition.

Symptoms. These are naturally variable, but are usually first detected by less than normal activity followed by standing dully apart, with the head nearly touching the ground.

Often there is more or less lacrymation together with mucous discharge from the nose, and not infrequently, some salivation. Temperatures range from 104°F. (40°C.) to 106°F. (41.5°C) or more, with a corresponding increase in pulse and respiration.

As the case advances, the animal becomes thin and weak, stands with legs apart, walks with wobbly gait, and finally when down, it may assume the attitude of a cow with milk fever, or lie prone with muzzle extended; or it may even show a meningeal involvement with the head extended backward (opisthotonus). Few cases fail to show, sooner or later, symptoms of both pneumonia and enteritis, although some show neither.

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Examination of the blood often shows only 30 per cent. of hæmoglobin.

The disease usually runs its course in seven to ten days, but may be longer or shorter. No doubt many mild cases escape detection, but some 80 per cent. or more of the recognisable cases, and all of the serious cases, die.

Lesions. Because of the multiple infections, the lesions are not constant. The carcase is invariably emaciated, the coat dull and rough. Usually the mucous membranes are pale; there is mucus within the nostrils and signs of earlier diarrhœa. Occasionally there is some excess pleural exudate. The lungs may show limited areas of broncho-pneumonia, with slight œdema, or, apparently in more chronic cases, large areas of a granular, fibrous lobar pneumonia exist.

The liver may appear normal, but is usually somewhat pale, or distinctly yellowish. The spleen is usually slightly enlarged and somewhat degenerated. Both liver and spleen lesions suggest anaplasmosis. The kidneys show little alteration; the urine being clear. The mesenteric lymph glands and vessels are more or less injected, thickened and reddened and the mucous membranes show some redness.

Treatment.—Nearly all the drugs in the pharmacopœia, including many biological products, have been tried, but with doubtful benefit. It is hoped to carry on further investigation of this ailment. At present, we are able to recommend only better hygienic and sanitary measures. These measures consist of disinfection of the umbilical cord when the calf is born in a shed or corral, providing sufficient, suitable feed, dry, comfortable sleeping quarters and ample space.

During the day the calves should be turned out into a well-drained pasture of young tender grass.

Veterinary Medicine.

At the 34th Annual Meeting of the Kansas Veterinary Medical Association, Dr. C. H. Kitselman, of Manhattan, estimated that 10,000 horses in Kansas suffered from an attack of infectious equine encephalomyelitis during the past season. The mortality was approximately 15 per cent. He regards ticks as the principal agent for the transference of the disease from animal to animal in the Kansas epizootic.

(*Veterinary Medicine*)

AN OBSERVATION ON BOVINE BREEDING*

C. H. SEAGRAVES, D.V.M.

Oregon City, Oregon.

Is the dairy cow more likely to conceive from an early or late heat breeding? This question if properly interpreted as set forth in this paper is of great importance to one in the sterility work of this species.

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* *North American Veterinarian, March,* 1938

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While I have merely this observation of optimum mating to discuss, I do want to emphasize that functional sterility, and particularly when due to dietary influence, is more often a cause of sterility than pathologic effects. Perhaps I don't appreciate the effects of endometritis, cervicitis, vaginitis, etc., but indeed it is of academic importance, at least in Bang's disease free herds of my experience, and while it would be gratifying to be able to diagnose some of these inflammatory changes, the accomplishment is diminished by the factor of unsatisfactory treatment.

Many brilliant researches have and are being made on the endocrin mechanism and in time we will perhaps be enlightened in the use of glandular products without the usual disturbance of the estrual cycle. These products must be specific and their use properly timed. This will call for skill in manual examination and dates on the times of heat.

The veterinarian should know the number of days from heat based upon her last three or four estrums when making an examination. The combination of several glandular products in a single injection are so uncontrollable that this hit or miss therapy should be condemned; as likely as not a normal estrum may be caused to be too early or several days late. One's good judgment gives way to an inquisitive instinct and so we try them. In the future it must be right when indicated, and to determine this indication of a hormone will call for a nice regard for cause and effect in the organs of reproduction.

Our physiologists tell us that ovulation takes place in the cow during the last hours of heat; that in the sow ovulation occurs during the metestrum (day after heat). The cat, ferret, and rabbit ovulate only by effect of coitus. Studies on the life of the sperm reveal that it lives but a short while—a few hours in the normal vaginal secretions—yet in this brief existence can travel a great distance, either by its own force or assisting ciliary propulsion within the uterus.

These studies of ovulation and sperm behaviour, while interesting and unquestionably of value, are but part of this story attaining to efficiency in conception of the bovine. The natural deduction from this research is that, if ovulation is a postoestrum occurrence in the cow and that sperms live but a few hours, breeding in the last period of heat should be most effective. This is the assumption and usual advice. However, it is the opposite of my observations, and is the purpose of this paper.

I have noted that cows that do not have access to the male except when the herdsman finds them in heat and later takes time to breed them require most service; that on the range the bull will single a cow out in proestrum and she usually is bred early in heat. " As heat comes on there is a copious flow of clear water mucus, as much as 250 c.c. from the cow." (Duke's Physiology of Domestic Animals.) This decreases as heat passes and is followed by the thick sanguinous one of postoestrum. The story is this, the sperms must have the help provided by this watery secretion of early oestrum for the swim through the cervical channel.

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In the ram when ejaculation is into, or in the mare when perhaps most of the semen enters the uterus this is not important.

To prove my contention in this phase of breeding, I have had three cows that were definitely coming in estrum every 21 days served once only the day before heat. Service was by restraint and it was 12 to 24 hours before any of them manifested an attitude of heat. From this pre-heat service I have two calves and one definite conception. All were bred to different bulls.

I wish to suggest, in addition, this garden variety method of treating " sterility " in the normal non-breeding cow, and particularly heifers. We shall call them *normal* in that they come in heat regularly, have never retained a placenta, and a manual examination discloses none of the inflammatory changes of the texture. Have the owner check the heats so the cow can be examined the *day before* oestrum. If no abnormality can be palpated or seen with the speculum, massage the cervix and irrigate the vagina with a 5 per cent sodium bicarbonate solution. A trace of potassium permanganate can be added by mixing in the mortar with the sodium, and makes it ideal for dispensing purposes. It will appear as a white powder while dry. Some advocate saline, but our results have been less satisfactory. After this insist on early breeding.

If a cow's cervix is large and flaccid she may be headed for a cystic ovary, and this will call for a radical change of diet, reduction of food intake, confined to green feed for the protein source. These animals are usually overfed on concentrates of high protein and sodium chloride content. You will be gratified with the results of reducing the flesh on these subjects and changing the diet. It's a question of a calf or milk for the time being.

Reviews

To Horse. By Capt. F. C. Hitchcock, M.C., with foreword by Colonel Sir Percy Laurie, K.C.V.O., C.B.E., D.S.O. Pp. 360, fully illustrated. Hurst & Blackett. Price 10/6.

Captain Frank Hitchcock is already well-known to our readers, and indeed, to all horsemen and lovers of horses, from his authorship of the two very popular books " Saddle Up " and " Stand To." His latest work " To Horse " is written in the same fascinating and readable manner, and will be sure to occupy a handy niche beside the other two, on every sporting man's bookshelf.

" To Horse," is not only good reading for the man who knows—or thinks he knows—something about a horse, but its chapters form a source of instruction to all who own—or desire to possess—their own riding horses; as well as to those who act in the capacity of riding instructors at riding schools.

The cult of the horse is by no means dead—in fact, for pleasure purposes, its revival—as illustrated by the numerous riding establishments and pony clubs that have sprung up like mushrooms all over Great Britain — is phenomenal, and there are very few districts of England where there is not a branch of the Pony Club which is itself affiliated with the Institute of the Horoe. All members

of the Pony Club should all have this book. In fact no more useful birthday or other present could be selected to encourage and please a deserving young rider.

In it will be found most valuable information which can be made use of by all who associate with and love horses—not only the boy or girl rider but those who are far more advanced and not only possess, but wish to groom and feed, etc., their own animals. There are chapters on the feeding, management and general care of the horse, both in and out of the stable; the different (correct and otherwise) styles of riding and deportment illustrated by most excellent diagrams and photographs.

The publishers have done their part well—the binding and facing being all that can be desired—both ornamental and useful. It is a book which can be picked up at any odd moment with the certainty that one will find a subject of interest whereby to while away an idle moment.

News

BIG DANISH EXHIBITION

TRUE PICTURE OF NATIONAL LIFE AND AGRICULTURE. ANGLO-DANISH TIES AND FRIENDSHIP.

To celebrate the 150th Anniversary of peasant emancipation, Denmark is organising a great National Agricultural Exhibition at Copenhagen this year from June 17th to 26th.

Announcing this national event at a luncheon, on Thursday, April 7th, at the Danish Club, London, Count Reventlow, the Danish Minister to this country, said that never before in the history of his country had such a comprehensive and ambitious exhibition been organised. It would show for the first time, the history, social condition and scientific efficiency of Danish Agriculture. King Christian X had given the undertaking his patronage, and would perform the opening ceremony.

It was in June, 1788, that the villenage system which bound the peasants to the estates of their overlords, was abolished. To-day, 150 years later, the descendants of those peasants are the small farmers who are the backbone of the Danish agricultural industry. Denmark, a country little bigger than Wales, now produces a quarter of the entire world's exports of butter and eggs, and two-thirds of the bacon imported into this country from foreign lands.

The Exhibition is no mere agricultural show; it is a truly national effort in which the whole kingdom will take part, including the remote Faroe Islands and the Greenland Settlements.

At the highest point of the Exhibition grounds at Bellahoj, just outside Copenhagen, will tower a lofty Maypole surmounted by golden sheaves, the symbol of the Exhibition; and in the centre, as in oldtime Danish villages, will stand the Village Tree, meeting-place of the Council of Elders.

An interesting feature will be a smallholding, with its scientifically designed and constructed buildings and machinery, and a smallholder in residence, busy with his daily occupations, to illustrate actual working conditions.

Every evening performances will be given in the huge open-air theatre. There will also be displays by Neils Bukh's famous gymnasts—Neils Bukh is the man who " straightened the backs of the Danish farmers "—and demonstrations of physical training by girl athletes from South Jutland. Folk-dancing in National costume will take place, and over 2,000 schoolchildren from all parts of the country will compete at sports.

In the vast arena, used for spectacles and displays, will be paraded the prize beasts, horses, cattle, sheep and pigs. Poultry will be represented by a big show; and special sections will be devoted to rabbit-breeding, bee-keeping and the breeding of fur-producing animals, all important rural industries.

Apart from the Dairy Section at Bellahoj a Dairy Show is being held at the Forum Hall in the centre of Copenhagen. Here butter, cheese and processed milk will be shown and every stage of their production demonstrated. Over 1,500 Danish dairies are taking part, butter, eggs and cheese being some of the country's most important exports.

Education and Co-operation, which have contributed so largely to Denmark's success, are naturally taking an important part in the Exhibition. Science aids Danish agriculture in countless ways. The research and application of scientific discoveries in planning and marketing, intensive production and grading will be shown.

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A special section will deal with the all-embracing system of co-operation, which covers the country. The Central Co-operative Committee, the body which co-ordinates the work and functions of the network of co-operative societies, will stage an exhibit showing the development of Danish co-operation from the earliest efforts.

Actually it was the efforts of the British Rochdale weavers at co-operation that served as the models for the Danes, one instance of the ties and friendship between the two countries that has always existed.

The woman's side of farm life, which is such an important factor in a successful agricultural community, will be dealt with in a special section wherein will be demonstrated the latest developments in domestic economy, labour-saving devices, rational feeding, and the care of babies.

In brief, this national Exhibition is planned faithfully to mirror a century and a half of Danish progress, to present a true picture of the Danish farmer's life, and to show the importance, at home and abroad, of Denmark's national industry of Agriculture.

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